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The influence of age of entrance to first grade on subsequent rate of scholastic development was tested in this longitudinal investigation. Forty-one pairs of boys and forty-nine pairs of girls, matched according to sex, intelligence, and socioeconomic status, were subjects. The mean chronological age of late entrants was 81 months, opposed to 72 months for early entrants. Reading, spelling, arithmetic, total language, and total achievement scores were obtained. Results of boys' rate of achievement revealed no significant differences. Late-entrant boys' rates tended to be faster than early-entrant boys' rates in all measures except arithmetic development. LEG's Late-entrant girls' rates reflected faster scholastic development than the early-entrant girls' rates. The results upheld Willard C. Olson's statement of the principle of resistance to displacement of rate of development in that initially faster rates of the early entrants declined and did not exceed the rates of development by the late entrants. (DO)

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AGE OF ENTRANCE INTO THE FIRST GRADE AS RELATED TO RATE OF SCHOLASTIC ACHIEVEMENT

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(A paper presented to the American Educational Research Association in Los Angeles, California, Feb. 8, 1969)

In a previous report* the longitudinal achievement of early and late entrants into the first grade was compared in grades one through six at approximately 89, 101, 113, 125, and 137 months of age. In general, the grade comparisons confirmed Baer (2), Carter (5), and King's (17) earlier observations. Grade by grade, the late entrants who had an 8 month age advantage over the early entrants, attained higher scholastic achievement.

The more significant comparison, of contemporary interest, concerns the efficacy of more schooling at an earlier age as a means of increasing the scholastic achievement of early entrants to grade one. This issue was dealt with in age comparisons when early entrants

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* Joseph Ilika, Age of Entrance into the First Grade as Related to Scholastic Achievement, unpublished doctoral disseration, the University of Michigan, 1963.

were known to have 7-8 months more schooling than late entrants. Consequently, the reading, spelling, and total achievement age comparisons revealed, in general, that early entrants attained higher mean initial estimated achievement ages at 89, 101, and 113 months of age when compared with late entrants. However, the reader can view the growth curves in Figure 1. and note that the initial advantages attained by early entrants withered away in such a fashion that by age 137 months there were no significant differences.

Other specific subject matter observations noted concerned the total language age comparisons between early and late entrant boys wherein the early entrants with initially higher scores at ages 88, 101, and 113 were reversed by ages 135 and 137 months. Indeed, a statistically significant difference in language age scores favored the late entrant boys at 137 months!

On the other hand, the arithmetic age growth curves of the early entrants sustained their initial advantages to such an extent that the early entrant boys had statistically significant differences at 125 months of age, and the early entrant girls had statistically significant differences at 137 months. With the exception of arithmetic instruction, the overview of the results support the advantages of maturation as a prelude to formal instruction in the elementary school.

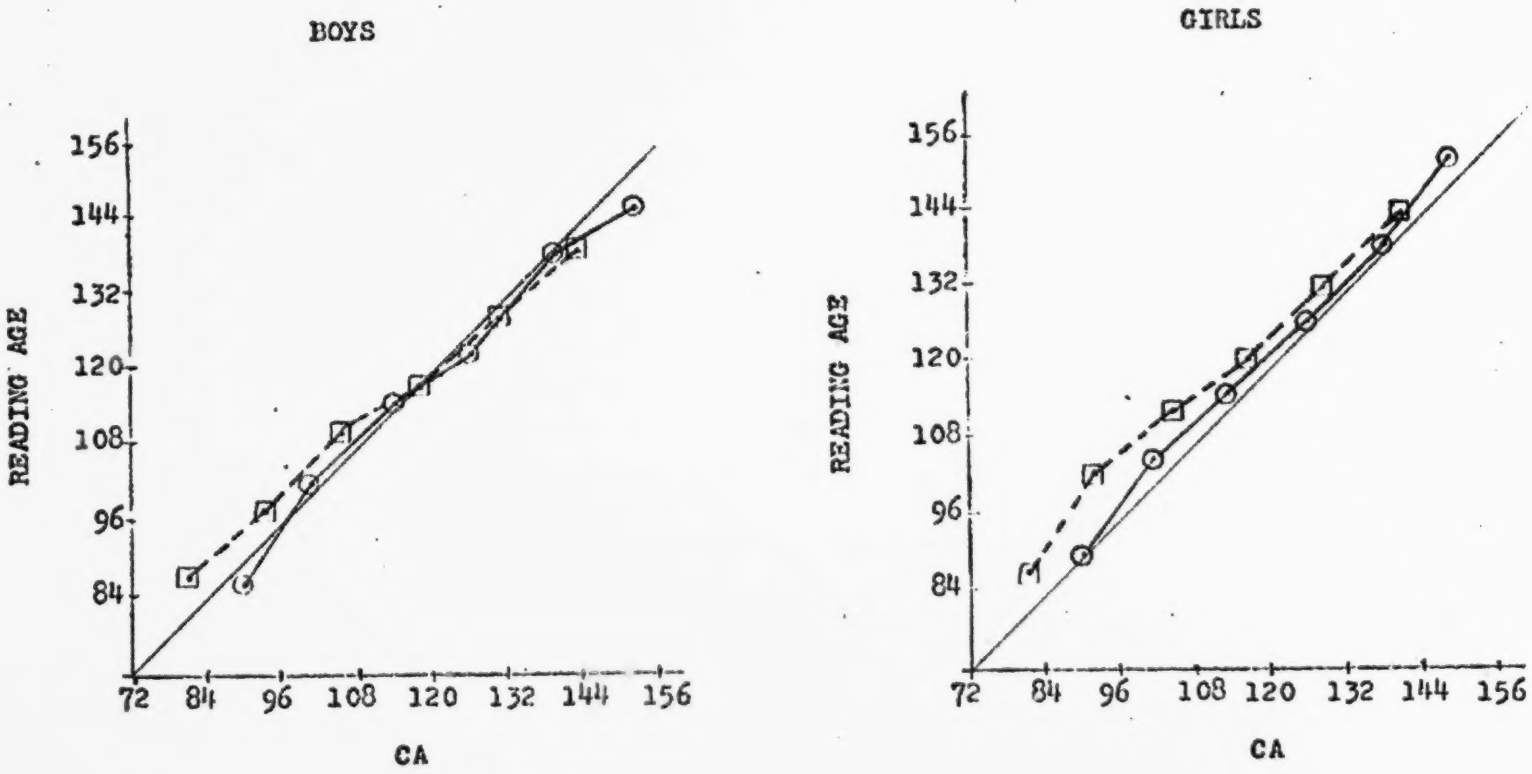
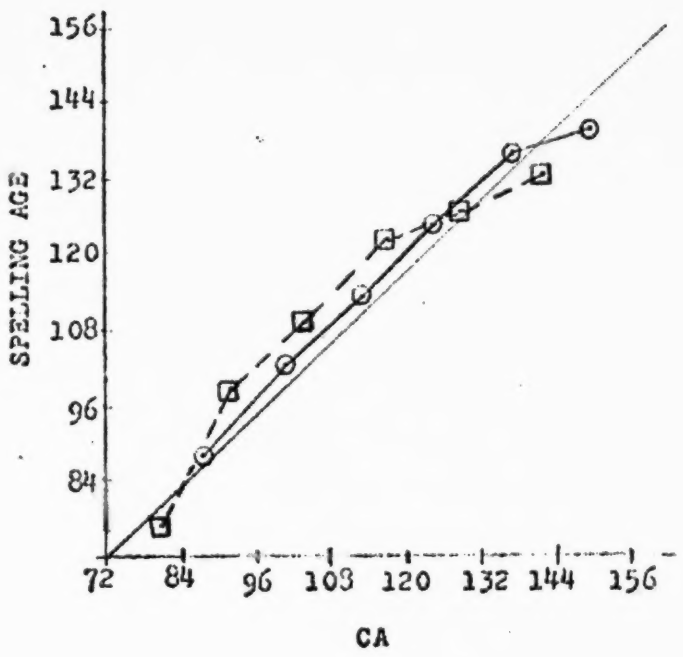


Figure 1. Achievement age growth curves of early and late entrant groups.

BOYS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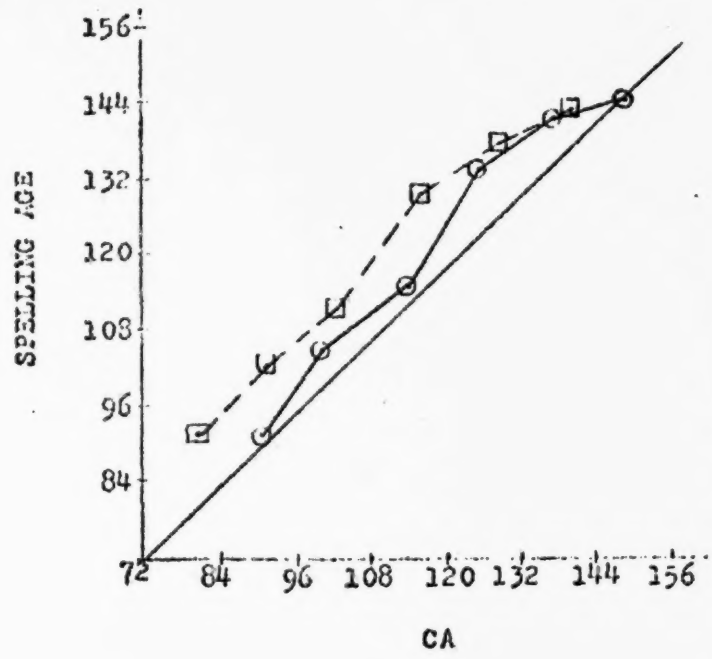
GIRLS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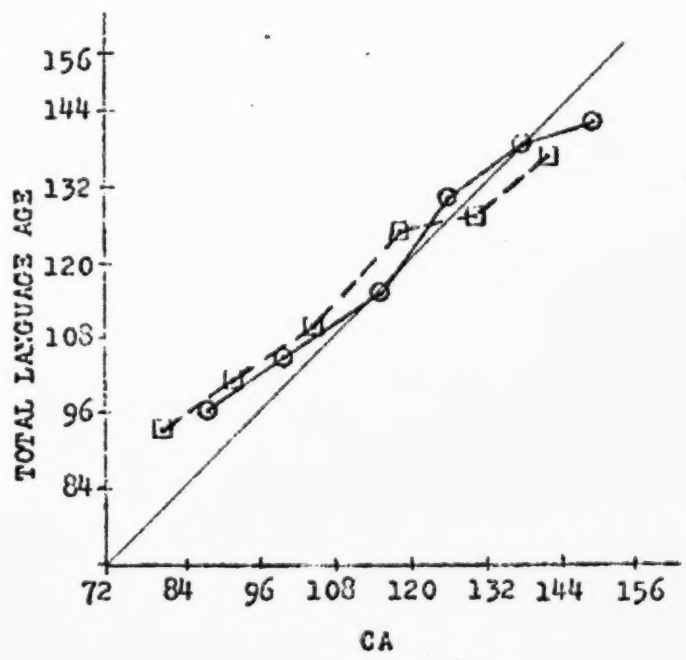
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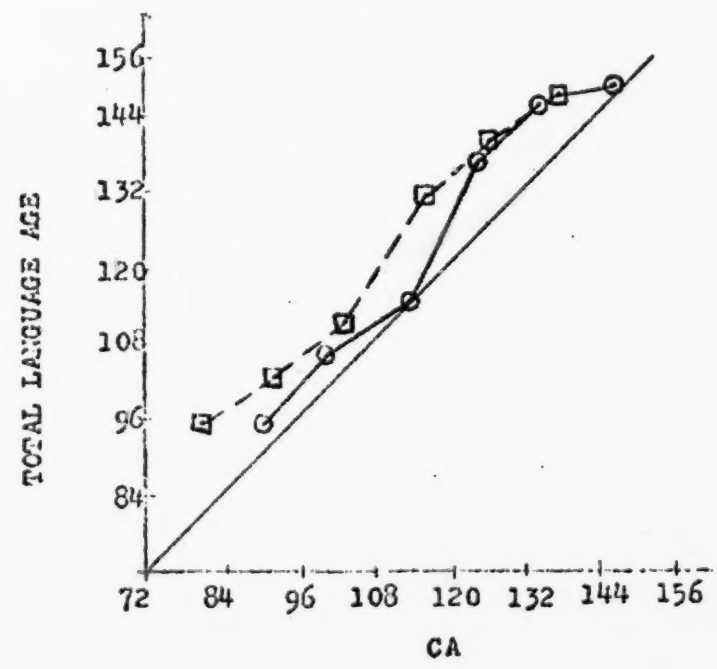
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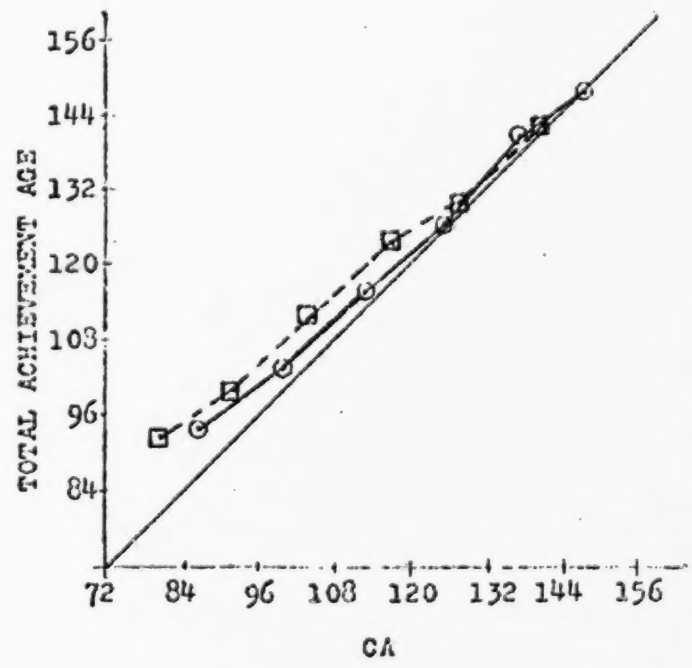
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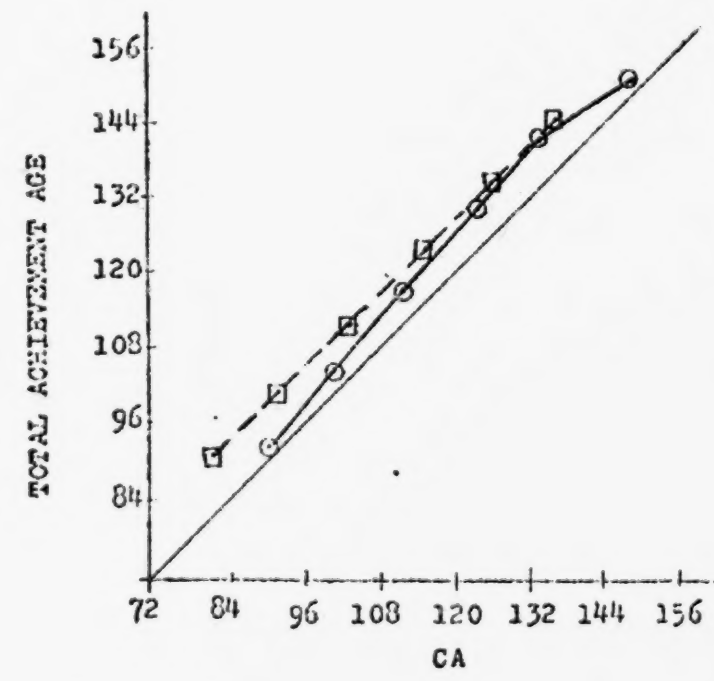
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The previous findings (1963) are compatible with Halliwell's (1966) review of the reviews of early entrance and school success, even though Halliwell appeared to be more concerned with children of higher mean intelligence than the children in this investigation.

PROBLEM

This investigation was designed to assess the influence of age of entrance to first grade on subsequent rate of scholastic development. Developmental theory holds that an early start in school will not result in a significant gain of scholastic rate of development of long term duration. The proposition in question is the principle of resistance to displacement, as stated by Olson: " . . . any organism in a systematic rate of change of growth tends to resist displacement caused by factors involving extra stimulation or deprivation and to restore a projection of the original rate when the factors are removed.", (23 p. 41).

This proposition was tested by comparing the rates of scholastic development of early and late entrants to grade one. The early entrants have the advantage of having started first grade eight months earlier than late entrants. Thus, the early entrants typify the condition of having been stimulated sooner when they were less mature, in contrast to the more mature late entrants.

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The significance of the issue in question lies in the fact that if the rates of reading, arithmetic, spelling, total language, and total achievement of early entrants is faster than that of late entrants, then the long term trends of younger age grade composition as reported by Lennon and Mitchell (19) and Gates (9) would be supported. Or, if a faster rate of development for some specific subject occurs, as a result of early entrance, the results might also suggest that earlier instruction in certain subjects is desirable.

On the other hand, if there is no real difference in rate of subject development or if the difference favors the late entrants, the significance would be that starting instruction at a later age, when children are more mature, is educationally more economical and efficient. The results of this investigation have implications for modifying school age of entrance policies and the timing of instruction in the various subjects of the curriculum.

PROCEDURE

Subjects

The subjects were 426 students of Lincoln Consolidated Laboratory School of Eastern Michigan University, Ypsilanti, Michigan, met the necessary requirements of kindergarten attendance, intelligence, and achievement test data. These subjects were divided into three equal age groups of 142 early, 142 average, and 142 late entrants. As many

as possible of the early and late age entrants were matched according to sex, intelligence, and socioeconomic status with the result that 41 pairs of boys and 49 pairs of girls were available for study. Children who repeated a grade are not included in this investigation.

In this investigation, the mean chronological ages of the late entrants were approximately 81 months in contrast to the mean chronological age of approximately 72 months of age for the early entrants.

Mean IQ Comparison Between Late and Early Entrant Groups,---

Table 1, shows the mean IQ comparisons of late and early entrant groups on the California Test of Mental Maturity. It can be noted that the mean IQ's were about 102 with standard deviations of approximately 11. None of the differences between the late and early entrant groups or between sex groups was statistically significant at the .05 level.

TABLE 1.

MEAN IQ COMPARISON BETWEEN LATE

AND EARLY ENTRANT GROUPS

	Late Entrants			Early Entrants		
	n	m	s	n	m	s	z
Boys	41	102.63	11.67	41	103.63	11.86	1.52
Girls	49	102.14	11.09	49	101.55	11.54	.95

A Chi-Square test of the observed frequencies of socio-economic status between late and early entrants and between sex groups was conducted. No significant differences were found.

The differences between mean number of days of school attendance by early and late entrant groups for the six years of elementary school attendance were not statistically significant at the .05 level. This supports the observation that the children in this study had equal amounts of schooling.

Method

The writer is indebted to the work of Anderson, Dixon, and Hughes (1957) which served as a model for the application of the method of least squares to the longitudinal data in this age of entrance investigation.

An examination of the growth curves of the early and late entrants revealed that a straight line trend was indicated by the subject age scores plotted against chronological ages of the early and late entrants.

The rate of each child's subject development was determined by solving for the value m in the solution of the linear equation $y = mx + b$, by using the method of least squares. In this investigation y is the intercept of the slope expressed as reading, spelling,

arithmetic, total language, and total achievement age scores, while x is the chronological age, and b is a constant (1, p. 484), (25). All of each child's available California Achievement Test subject age scores (y's) and their corresponding chronological age values (x's) from grade 1-6 were utilized to compute the rate of development (m). m describes the increase in (y's) as (x) increases.

Thus, for example, in Table 2, the EEB's (early entrant boys) had a mean reading age rate of 0.97 months as the EEB grew 1.00 month in chronological age (8).

On the other hand, the LEB's (late entrant boys) mean rate of reading age development was (1.00) in relation to one month increase in chronological age. The difference between the EEB and LEB's mean rates of development is not significant.

RESULTS

The Influence of Age of Entrance Into Grade One on Subsequent Rate of Scholastic Achievement --- Boys, Table 2, Reveals that there were no statistically significant differences in mean rates of development in the measures of reading, arithmetic, spelling, total language, or total achievement age scores. The mean rates of late entrant boys tends to be faster than the early entrant boys in all measures except arithmetic. The slowest rate was 0.41 and the fastest rate was 1.37. The size of the standard deviations reveals that con-

siderable variation in rates of development exist.

TABLE 2.

THE INFLUENCE OF AGE OF ENTRANCE INTO GRADE ONE ON SUBSEQUENT RATE OF SCHOLASTIC ACHIEVEMENT - BOYS

Achievement Age	N of Pairs	Degrees of Freedom	Early Entrant m	Early Entrant s	Late Entrant m	Late Entrant s	D	t
Reading	41	293	0.97	0.30	1.00	0.28	-.03	1.49
Total Arithmetic	41	231	0.97	0.24	.95	0.21	.02	.75
Spelling	41	212	0.81	0.39	.88	0.37	-.07	1.30
Total Language	41	218	0.82	0.30	.86	0.31	-.04	.95
Total Achievement	41	228	0.89	0.22	.90	0.23	-.01	.56

The Influence of Age of Entrance Into Grade One on Subsequent Rate of Scholastic Achievement----Girls, Table 3, reveals that in the comparisons between EEG (early entrant girls), and LEG (late entrant girls), the differences between the mean rates of development were statistically significant at the .05 and .01 level in favor of the

LEG in the Reading Age and Total Achievement Age Comparisons. All LEG's rates of development reflect faster scholastic development than the EEG.

The results from Table 2 and 3 indicate that with the exception of EEB's (early entrant Boy's) arithmetic age mean rate of development, the LE's (late entrants) develop more rapidly. These results are sufficient reasons to observe that the EE (early entrant) rates of scholastic development, as influenced by an earlier start, has not resulted in a significant change in rates of development in favor of the early entrants. In fact, the general trend is one of slower development for the early entrants. Therefore, these results tend to uphold Olson's statement of the principle of resistance to displacement of rate development in that initially faster rates of the early entrants declined and did not exceed the rates of development by the late entrants. In the case of the reading rates of development, the EE growth curves clearly decline after 108 months and therefore suggest a restoration to the original rate. Similar hothouse and wilting effects are evident in spelling, total language and total achievement growth curves.

The arithmetic age rate comparisons suggest that rates of development are not significantly different for both sexes. The EE's maintained statistically significant differences, EEB's 3.21

months and EEG's 5.58 months in the previous achievement age comparisons. In the case of the EEB's, the faster rate of development continued, and the LEG's, seemed to increase in rate of development, perhaps to restore the deficit observed in the growth curves at CA 136.

TABLE 3

THE INFLUENCE OF AGE OF ENTRANCE INTO GRADE ONE ON SUBSEQUENT RATE OF SCHOLASTIC ACHIEVEMENT - GIRLS

Achievement Age	N of Pairs	Degrees of Freedom	Early Entrant m	Early Entrant s	Late Entrant m	Late Entrant s	D	t
Reading	49	375	0.94	0.26	1.00	0.21	-.06	2.04*
Total Arithmetic	49	298	0.95	0.25	.96	0.18	-.01	.16
Spelling	49	283	0.91	0.33	.99	0.37	-.08	1.82
Total Language	49	285	0.92	0.28	.96	0.22	-.04	.99
Total Achievement	49	295	0.92	0.23	.98	0.16	-.06	2.80**

*Statistically significant at the .05 level
**Statistically significant at the .01 level

DISCUSSION

Reading Rates

The timing of reading instruction for the early entrants reveals the same trends observed by Keister (1940). Morphett and Washburne (1940), and Holmes (1964). Keister noted that the reading gains of underage children lacked permanence. Morphett and Washburn's study showed that children delayed in reading overcame their initial slow starts. Similarly, Holmes and Singer (1964) summed up the then available reports of Durkin's 1960, 1961, and 1962 progress reports and" . . . found, by extrapolation, that the median reading achievement curves of the experimental and control groups should converge at the eight grade level!" (12;147).

The collective findings suggest that there are problems of starting instruction too early and starting instruction too late. The preceding have parallels in over-teaching and under-teaching. This resembles a "Peter-Paul" relationship wherein time due arithmetic instruction is given to reading, to the detriment of arithmetic. Thus, Brekke (1963) found that the median number of minutes of reading instruction was 450 minutes per week. This estimate is at least 40 percent greater than the median instructional time devoted to arithmetic, if Miller's (1960) report is used for comparisons.

Arithmetic Rates

In previous publications (1963) (1968) the writer reported the remarkable stability of the early entrant arithmetic age score differences, which remained statistically significant at 0.5 and 0.1 level at CA 125 and 136, as the previous growth curves illustrate. Superior early entrant arithmetic achievement can be interpreted to reflect the fact that more stress on arithmetic at an earlier age is beneficial and in terms of instructional economics it is justified. Miller (1960) noted that American children receive considerably less arithmetic instruction than children of other countries.

Insofar as arithmetic is concerned, the early entrants in this investigation appear to have had the same optimum mean entry age of 72 months, as suggested by Husén's (1967) interpretation of the International Study of Achievement in Mathematics. Moreover, Husén states; "The loss of a year of schooling between 6 and 7 appears to have a detrimental effect on mathematical attainment at 13," (13,VII,p.68). This is almost exactly the case of the late entrants whose mean age of entrance was slightly higher than 82 months.

It is plain from the preceding discussion that the earlier timing of arithmetic instruction by early entrance is feasible to increase the long range mathematical development of children.

The implication is clear that over-teaching and under-teaching has existed in areas of reading and arithmetic as evidenced by early entrant and early reading investigations. Therefore, the preceding facts mitigate arguments which might be raised to indicate the exception of arithmetic to the principle of resistance to displacement.

Spelling and Total Language

Of the four entrant groups, the EEB's are the least mature. These findings agree with the research summaries of individual differences by Tyler (1965) and Maccoby (1966). EEB's had the lowest spelling, total language, achievement age scores, and rates of development. This suggests that early entrance into the first grade could be injurious to the linguistic development of the EEB's since their social environment would be over-stimulating. It is interesting to note that, in the original sample, twice as many EEB's were retained as were LEB's. These findings signify a greater need for further study of EEB's in terms of school organization, curriculum theory, and child development. It is encouraging that early identification programs have been developed recently to prevent the over-stimulation of immature children.

The LEB's also had an unfavorable and statistically significant difference at .05 level in a comparison of total language with the LEB's. Since LEB's and LEG's did not have statistically significant

differences in mean rates of spelling development, it is reasonable to assume that the LEB's language-grammar usage portion of the total language test mean was their weakness. Tyler's (1965) summary of research also supports the notion that LEB's would be less fluent linguistically than late entrant girls in their rate of development. The magnitude of the standard deviations (0.33-0.39) accentuates the wide range of individual differences in the various entrant groups.

Total ^chievement Rates

The faster rate of development of the late entrants accounts for the convergence of the EE and LE growth curves. The indications are that the data as a whole also supports the observation that neither achievement or rate of development was favorably influenced by early entrance into grade-one with the exception of arithmetic instruction. Again, attention should be given to the EEB's who have the slowest overall rates of development and achievement.

SUMMARY OF THE FINDINGS

1. The early entrants failed to attain statistically significant differences in spelling, total language, reading, and total achievement even though they had a 7-8 month advantage of schooling.

2. Early entrant rates of development were consistently slower in reading, spelling, total language, and total achievement, with the exception of LEG's arithmetic age rate of development.

3. LEG's were favored by significant differences in reading age and total achievement age rate of development comparisons.

4. The 7-8 month schooling advantage of early entrance appears to have favorably influenced arithmetic achievement with statistically significant differences at CA 125 for the EEB's and at CA 137 for the EEG's. EEB's had faster rates of arithmetic development than LEB's in contrast, however; the LEG's rate of arithmetic development was faster than the EEG's. Differences were statistically not significant.

Sex Differences in Rates of Development

5. Absence of sex differences in mean rate of reading development confirms similar findings by Anderson, Dixon and Hughes (1).

6. No significant differences were found in spelling and total language between EEB's and LEB's when compared to EEG's.

7. Significant differences in rates of development at .05 level favored LEG's.

   a. EEB's were compared to LEG's in spelling, total language, and total achievement.

   b. LEB's were compared with LEG's in total language and total achievement.

ACKNOWLEDGEMENTS

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